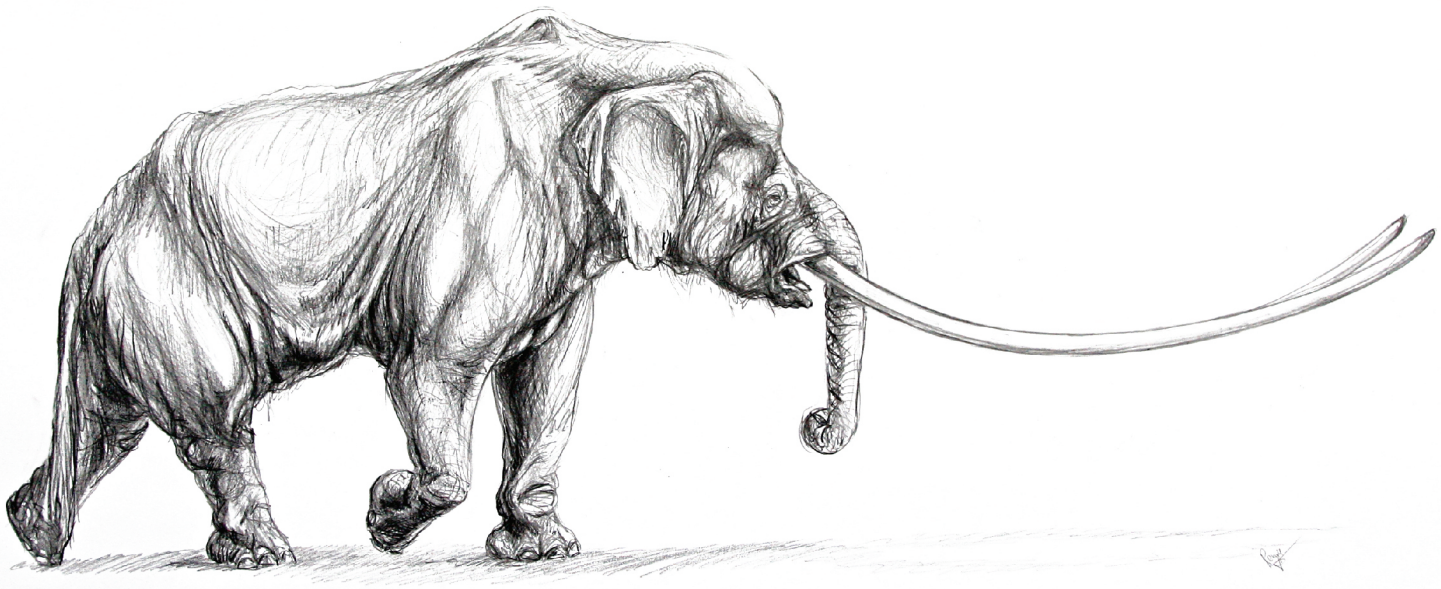
SCIENTIFIC ANNALS of the School of Geology,
Aristotle University of Thessaloniki

SPECIAL VOLUME 102



GREVENA
SIATISTA
GREECE 2014

VIth International Conference on Mammoths and their Relatives

ABSTRACT BOOK

Editors:
Dimitris S. KOSTOPOULOS, Evangelos VLACHOS, and Evangelia TSOUKALA

THESSALONIKI, MAY 2014

Why are there no giants at the dwarf's feet? Insular micromammals in the eastern Mediterranean

Lars VAN DEN HOEK OSTENDE ✉, Jesse HENNEKAM, Alexandra VAN DER GEER, and Hara DRINIA

Dwarfed proboscideans are probably the most spectacular example of island evolution, with the 120 cm tall *Palaeoloxodon falconeri* from Sicily as prime example. Also the islands of the Aegean housed elephant species with a much reduced body mass, such as *Mammuthus cretensis* and *Palaeoloxodon creutzbergi* (Crete), *Palaeoloxodon tiliensis* (Tilos), *Palaeoloxodon cypriotes* (Cyprus) and a new species of *Palaeoloxodon* from Naxos (Van der Geer et al., submitted). Not all size changes in proboscideans are equally spectacular. *Palaeoloxodon creutzbergi* from Crete was about 50% the size of its presumed mainland ancestor, whereas the other Aegean species dwarfed to less than 10% of the ancestral size (Lomolino et al., 2013).

Insular micromammals also show adaptations in their body size (Foster, 1964). They tend to grow larger on islands and here, too, the size changes can be quite spectacular. In contrast to the proboscideans, some of these insular forms still survive today, such as *Papagomys* on Flores (Locatelli et al., 2012) and *Phloemys* on the Philippines. Examples of insular giants in the Mediterranean are only known from the fossil record, but they are many and varied. Giant glirids include *Hypnomys* (Baleares), *Stertomys* (Gargano), and *Maltamys* and *Leithia* (Sicily, Malta). Giant murids comprise *Anthracomys* (Tuscany), *Mikrotia* (Gargano) and *Kritimys* (Crete). Giant lagomorphs are the giant rabbit *Nuralagus* and the giant pikas *Gymnesicolagus* (Balearics) and *Prolagus imperialis* (Gargano). Other families have fewer examples of spectacular gigantism: the giant hedgehog *Deinogalerix* and giant hamster *Hattomys* (Gargano) and the giant shrew *Nesiotites* (Balearics). Some of these genera (*Mikrotia, Stertomys*) show an adaptive radiation, in which lineages of different body size live together. This phenomenon is also known from Flores; the different endemic murids of the island presumably belong to a single clade (Locatelli et al., 2012).

Whereas gigantism, often accompanied with adaptive radiation, is a common feature in insular micromammals, it is conspicuously absent in the eastern Mediterranean. Admittedly, *Kritimys* must be considered a giant rat, well larger than the Brown Rat and likely about four times the mass of its ancestor (Lomolino et al., 2013). As Mayhew (1977) determined, there is no indication of a radiation within the genus. In contrast, the geologically younger *Mus minotaurus* was only about 20% larger than the house mouse *M. musculus* (Mayhew, 1977). Moreover, the mouse from Cyprus, *Mus cypriacus*, wasn't even recognised as an endemic until DNA-analyses proved it to be a separate species (Cucchi et al., 2006). The mouse that co-occurs with the new dwarf proboscidean from Naxos turned even out to be a mainland species, *Mus mystacinus* (Van der Geer et al., submitted). Apart from the near lack of extreme gigantism, it is remarkable that murids did not show any speciation on Crete, whereas the island was large enough to support an entire adaptive radiation of deer.

The clues behind the absence of gigantism in the eastern Mediterranean are:

1) Spectacular gigantism in Late Pleistocene rodents in the Mediterranean is only found in dormice (*Hypnomys, Maltamys, Leithia*). The family never successfully colonised the Aegean islands.

2) The only clearly enlarged murid in the area, *Kritimys*, belongs to the early Middle Pleistocene.

3) Giant murids that show an adaptive radiation with different sizes are restricted to the Late Miocene of the Mediterranean (Gargano) or the Tropics (Flores, Philippines).

Mayhew (1977) already indicated that climate was a major factor in the size changes of the insular rodents from Crete. We concur, but the process is just the opposite of what he proposed. Climatic conditions favoured the smaller, r- select species. Dormice, because of their capability to hibernate or go into torpor during unfavourable circumstances, are better equipped to deal with harsh winter conditions than murids. The latter still needed to invest in high reproduction rates in order to survive, rather than go into a K-select mode with larger bodies. Size differentiation is the main driver behind adaptive radiation, and hence the lack of possibilities for attaining large body sizes also blocked the opportunity for adaptive radiations.

We learn to understand rules by their exceptions. In this regard, the absence of insular giants on the Aegean Islands provides a valuable insight into the process of insular evolution.

This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF) - Research Funding Program: THALIS –UOA- Island biodiversity and cultural evolution: Examples from the Eastern Mediterranean, Madagascar, Mauritius and Philippines during the past 800,000 years.

References

Cucchi, T., Orth, A., Auffray, J. C., Renaud, S., Fabre, L., Catalan, J., Hadjisterkotis, E., Bonhomme, F., Vigne, J.D., 2006. A new endemic species of the subgenus *Mus* (Rodentia, Mammalia) on the Island of Cyprus. Zootaxa 1241, 1-36.

Foster, J.B., 1964. Evolution of mammals on islands. Nature 202, 234-235.

van der Geer A.A.E., Lyras, G.A., van den Hoek Ostende, L.W., de Vos, J., Drinia, H., submitted. A revision of the palaeozoogeography of the Cycladic Islands (Greece) during the Pleistocene in relation to adjacent areas. Palaeogeography, Palaeoclimatology, Palaeoecology.

Locatelli, E., Rokus Awe Due, van den Bergh, G.D., van den Hoek Ostende, L.W., 2012. Pleistocene survivors and Holocene extinctions: the giant rats from Liang Bua (Flores, Indonesia). Quaternary International 281, 47-57.

Lomolino, M.V., van der Geer, A.A., Lyras, G.A., Palombo, M.R., Sax, D.F., Rozzi, R., 2013. Of mice and mammoths: generality and antiquity of the island rule. Journal of Biogeography 40, 1427-1439.

Mayhew, D.F., 1977 The endemic Pleistocene murids of Crete I-II. Proceedings of the Koninklijke Akademie van Wetenschappen (Series B) 80, 182-214.

Vos, J. de, 1984. The endemic Pleistocene deer of Crete. Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde, Eerste Reeks 31, 1-100.

✉ Lars.vandenHoekOstende@Naturalis.nl

Citation:
van den Hoek Ostende, L., Hennekam, J., van der Geer, A., Drinia, H., 2014. Why are there no giants at the dwarf's feet? Insular micromammals in the eastern Mediterranean. Abstract Book of the VIth International Conference on Mammoths and their Relatives. S.A.S.G., Special Volume 102: 209.